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EXAMINER

CHEN, TIANJIE

ART UNIT PAPER NUMBER

2627

DATE MAILED: 12/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/613,559

Applicant(s)

GILL, HARDAYAL SINGH

Examiner

Tianjie Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Final Rejection (RCE)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claim 1-11, 14-22, 24-26, and 29-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parkin (US 6,153,320) in view of Lin et al (US 6,127,053).

Claims 1, 9, and 12; Parkin shows a magnetic head in Fig. 1, including: a free layer 90 (Column 4, line 9), an antiferromagnetic layer 66 (Column 4, line 28) spaced apart from the free layer; and an antiparallel (AP) pinned layer structure 70 (Column 4, line 19) positioned between the free layer and the antiferromagnetic layer and having a net magnetic moment equal to about zero (Column 4, lines 55-59); wherein the AP pinned layer structure includes antiparallel pinned layers 72 and 74 and an AP coupling layer 73 (Column 4, lines 19-24), wherein the antiparallel pinned layers have identical thickness of 30 Å (Column 4, lines 19-24) measured in a direction perpendicular to planes of deposition thereof; ; wherein the antiferromagnetic layer inherently provides a coercivity that enhances pinning of the AP pinned layer structure since it is basic function of a pinning layer; the thickness of the AP coupling layer is chosen as 5 Å and the thickness of the pinned layers are selected as 30 Å , which provide a pinned layer structure field of at least 5/ or 10 KOe (Fig. 3).

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Parkin does not show an in-stack bias layer for stabilizing the free layer, wherein the free layer is positioned between the bias layer and the AP pinned layer structure, wherein the bias layer is not adjacent an antiferromagnetic layer.

Lin et al a magnetic head in Fig. 4a, wherein an in-stack bias layer 406 for stabilizing (keeping) the free layer, wherein the free layer is positioned between the bias layer and the AP pinned layer structure, wherein the bias layer is not adjacent an antiferromagnetic layer; and also teaches that the keep layer provides flux closure for the saturated magnetization of pinned layer resulting in cancellation of the magnetostatic field from the pinned layer (Column 6, lines 42-48). One of ordinary skill in the art would have been motivated to add the keep (biasing) layer into Parkin's device for canceling the magnetostatic field from the pinned layer.

Claim 7, Parkin shows the antiferromagnetic layer is made of PtMn (Column 4, line 27-31), which is the same material as used in this Application, which inherits a high positive magnetostriction.

Claim 8, Parkin also shows that the AP pinned layer structure includes at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other, the pinned layers being separated by an AP coupling layer (Column 4, lines 51-59).

Claim 10, the magnetic anisotropy always has two direction, one is easy axis and another is hard axis. Anisotropy of the AP pinned layer structure should have two orthogonal directions, Fig. 1 shows that one is perpendicular and one is parallel to the ABS of the reading head.

Claim 14, Parkin shows that the head forms part of a GMR head (Column 1, lines 14-18).

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Claims 15-17, Parkin shows that the head forms part of a CPP/or CIP/or tunnel junction sensor (Column 1, lines 14-18).

Claim 33, Parkin further shows it is sued for a magnetic storage system (Abstract), which inherits: magnetic media; at least one head for reading from and writing to the magnetic media, each head having: a sensor having the structure described above, a write element coupled to the sensor; a slider for supporting the head; and a control unit coupled to the head for controlling operation of the head.

Claims 4 and 5, Parkin shows that the antiferromagnetic layer is constructed of PtMn having thickness of 90 Å (Column 4, lines 27-31).

Claims 18, 21, 24, and 27, as described above, Parkin shows a magnetic head, including: a free layer, an antiferromagnetic layer spaced apart from the free layer, the antiferromagnetic layer being constructed of PtMn having a thickness of 90 Å; and an antiparallel (AP) pinned layer structure positioned between the free layer and the antiferromagnetic layer, wherein the AP pinned layer structure includes at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other through large magnetic anisotropy due to positive magnetostriction and a small net moment for the antiparallel pinned layers, the pinned layers being separated by an AP coupling layer; wherein the antiferromagnetic layer provides a coercivity that enhances pinning of the AP pinned layer structure; and the thickness of the AP coupling layer and the thickness of the pinned layers are selected to provide a pinned layer saturation field of at least 5/or 10 KOe.

Claims 2, 3, 6, 19, and 20; Parkin shows the antiferromagnetic layer, which is made of PtMn, which is the same as disclosed in this Application; therefore, it should inherit a coercivity of at least about 300/400 Oe.

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Claims 11 and 26, Parkin shows a head as described above, does not specifically show that the head is adapted to read from media having a bit density of at least about 200 Gbit/in. .

However, applicant claims that his head is adapted to read from media having a bit density of at least about 200 Gbit/in without disclosing particular features directly for reaching this specific density. Parkin shows a head having same structure as described above. One of ordinary skill in the art would have been reasonably expect that can also be adapted to read from media having a bit density of at least about 200 Gbit/in.

Claim 22, as described above, Parkin shows that the antiferromagnetic layer has a high positive magnetostriction.

Claim 25, as described above, Parkin shows that the magnetic anisotropy of the AP pinned layer structure is oriented perpendicular to an ABS of the reading head.

Claims 29-32, as described above Parkin shows a head, wherein the head forms part of a GMR head/CPP/CIP/tunnel junction sensor (Column 1, lines 14-18).

Claim 34, as described above, Parkin shows a magnetic storage system (Column 3, line 30), which inherits magnetic media; at least one head for reading from and writing to the magnetic media, each head having: a sensor having the structure as described above, a write element coupled to the sensor; a slider for supporting the head; and a control unit coupled to the head for controlling operation of the head.

2. Claims 13 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parkin and Lin et al in view of Pinarbasi (US 2003/0179513).

Claims 13 and 28, Pinarbasi shows in Fig 9 a head including a bias layer 140 formed along a track edge of the head, the bias layer stabilizing the free layer. It would have been obvious at the time the invention was made to one of ordinary skill in the art to add the bias layer for optimizing the sensor.

3. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Parkin and Lin et al in view of Parker et al (US 2004/0057164).

Claim 23, Parker et al shows that NiFe and CoFe are alternatives used for a pinned layer ([0032]); it is also well known in the art NiFe and CoFe are most commonly used material for the pinned layer. One of ordinary skill in the art would have been expected to include CoFe as an alternative of NiFe for the pinned layer; Parkin also shows that the AP coupling layer is constructed of Ru.

Response to Arguments

4. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's argument related to Sato's reference is irrelevant since Sato's reference has not been cited in the previous rejection.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tianjie Chen whose telephone number is 571-272-7570. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on 571-272-7579. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


TIANJIE CHEN
PRIMARY EXAMINER